Article

Production and marketing of mamey in Alpoyeca, Guerrero: opinion of producers

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Abstract

Mexico is the main producer of mamey (*Pouteria sapota*) in the world; however, it is perceived that the production and commercialization of the fruit is affected by various biological, technical and socioeconomic factors that negatively impact the development of the production chain. To have direct evidence of the case, in 2017, mamey producers from the municipality of Alpoyeca, Guerrero were interviewed, aiming to know and analyze their opinion of the problem for production and marketing. Fifty mamey producers were interviewed and the information was collected through a questionnaire. The factors that affect the production and commercialization of mamey were grouped into biological, technical and socioeconomic. Biologics are related to the presence of pests and diseases that drastically affect the useful life of plants and fruit. The declared technical problems were aging plants, poor management of the orchard that affects production, health and quality of the fruit. Socioeconomics have to do with the lack of economic resources, low product prices, lack of institutional support and intermediaries. In this way, production and marketing is affected by poor management of the garden due to technical ignorance of the producers, low economic solvency, lack of a secure market and the lack of institutional support, which is aggravated by the poor organization of producers.

Keywords: *Pouteria sapota*, organization, perceptions.

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Introduction

The mamey [*Pouteria sapota* (Jacquin) H. E. Moore & Stearn] is a fruit tree that has the potential to be cultivated in 15 of the 32 states of the Mexican territory (Núñez-Colín *et al*., 2017). Its production is concentrated in the south, southeast, west and in some central states such as Morelos, Estado de Mexico, San Luis Potosí and Hidalgo (Velázquez *et al*., 2015), with an area of 1 618 hectares and total production of 20 120 t of fruit, with a national average yield of 12.4 t ha^{-1} (SIAP, 2018).

The fruit is highly perishable, which makes it difficult to market it in fresh fruit markets, so it needs refrigeration to maintain quality and shelf life. Therefore, it is generally consumed fresh and frozen pulp (Villegas-Monter *et al*., 2016) and is marketed in local markets close to the producing areas, since its export is an incipient activity (ICUC, 2005; Villegas-Monter *et al*., 2016). However, according to Toral (1988); Saavedra *et al*. (2014), it is a fruit tree that has high productive potential, and if an added value were given to the fruit, it would be very profitable.

In the primary production aspect, Sandoval *et al*. (2006) indicate that there is a lack of improved varieties, efficient management of the orchard and post-harvest of the fruit. In this regard, Villegas-Monter *et al*. (2016), mention that in commercial mamey plantations, fruit-associated and backyard agroforestry plantations, they use locally selected genotypes.

The studies carried out on this fruit tree have focused on various aspects, such as diversity and uses (Villegas-Monter *et al*., 2016), phenology and characterization of the fruit (Sandoval *et al*., 2006; Gaona-García *et al*., 2008; Domínguez *et al*., 2010; Aguilar *et al*., 2015), phytosanitary problems (Tovar-Pedraza *et al*., 2012; Vásquez-López *et al*., 2012; Tovar *et al*., 2013; Ariza-Flores *et al*., 2018), irrigation and fertilization (Vallejo-Pérez *et al*., 2009), post-harvest management (Martínez *et al*., 2006; Ramos-Ramírez *et al*., 2009; Alvárez *et al*., 2011; Gómez-Jaimes *et al*., 2012; Villarreal-Fuentes *et al*., 2015), quality and post-harvest characteristics of the fruit (Espinosa-Zaragoza *et al*., 2016).

Commercial value (Ricker, 2001; Nava and Ricker, 2004; Velázquez *et al*., 2015), pulp industrial potential (Saavedra *et al*., 2014) and distribution (Nava and Ricker, 2004; Domínguez *et al*., 2010; Velázquez *et al*., 2015; Nuñez-Colín *et al*., 2017), mainly. They have neglected aspects of producer organization and the perceptions they have of different problems for the production and marketing of the fruit of mamey.

In 2018, in the Mexican territory 15 mamey producing states were reported, based on the planted area they stand out Yucatan (511 ha), Guerrero (386 ha), Chiapas (114 ha), Puebla (107 ha) and Tabasco (1 014 ha) as the most producers. Yield per hectare was higher in Yucatan (26 t ha^{-1}) and Veracruz (21 t ha^{-1}) and with more modest yields, Puebla (12 t ha^{-1}), Campeche (12 t ha^{-1}) and Guerrero (9.6 t ha^{-1}) (SIAP, 2018).

In Guerrero mamey is produced in at least 15 municipalities; among those with the largest production and area are Huamuxtitlan, Alpoyeca and Cuetzala del Progreso, with around 234 ha, with an average yield of 10.6, 12.3 and 9.8 t ha^{-1}, respectively (SIAP, 2018). In Alpoyeca there are approximately 67 ha with mamey, with an average yield of 12.3 t ha^{-1}, it is cultivated mainly on small surfaces in production systems such as monoculture and multi-cultivation (associated with other fruit trees and with annual crops), in small orchards and backyards.

The producers who dedicate themselves to this crop have it as part of a production strategy to get food and economic resources throughout the year, since they dedicate themselves to different off-farm activities to obtain income that allows them to satisfy various basic needs such as food and dressed. Thus, it is perceived that there is a neglect of management in the production and marketing of the fruit, which according to the Committee System Product Mamey Guerrero AC (2012), the lack of organization of producers and low technological level to improve production and profitability of mamey, limits the expectations for commercialization.

Based on the above information, since in the various studies that have been documented of mamey fruit, there is no explicit evidence that the producers' point of view has been included in the research process, the purpose of this work was to know and to analyze the opinion of the mamey producers of Alpoyeca, Guerrero in relation to the problem of production and commercialization of the fruit, with the purpose of analyzing the possible causes that provoke it.

Materials and methods

The study was carried out in 2017 in the Municipal capital of Alpoyeca, Guerrero, located in the Montaña de Guerrero region. The research was quantitative with a descriptive approach. Based on information from SAGARPA (2011) in Alpoyeca, Guerrero, there were 61 registered producers with mamey cultivation. From this population, the criterion used was to select those who had half or more hectares of surface with mamey plants (plants in development or production) as monoculture or mixed orchards with fruit trees or other crops.

The number that resulted were 50 producers, who were interviewed through a questionnaire of closed and open questions (Sampieri *et al*., 2006). The interview is a tool that allows data or information to be obtained from the subject who, through oral interaction with the researcher, collects information on the research topic (Vargas, 2012), enriching the data for the research task (Troncoso-Pantoja and Amaya -Placencia, 2017). The information collected in the questionnaire had to do with information on the production sites, problems for the production and marketing of the mamey. For the statistical analysis the information collected was encoded and captured in an Excel database, it was analyzed through descriptive statistics using the SPSS Statistics 19 statistical program.

Results and discussion

Property characteristics

The average area cultivated with mamey was 1.6 ha with approximately 113 trees per hectare. Land tenure was grouped into smallholders (44%), common (32%) and communal (20%). 16% of the mamey producers have it in monoculture, 84% in association, with other fruit trees (55%), or with fruit trees, corn and beans (29%). According to Olvera *et al*. (2012) indicate that in the municipalities of Huamuxtitlan and Alpoyeca, Guerrero, a producer can have from one to 15 species on a farm, without detecting a significant correlation between number of species and farm size. This is because there are small farms with plant diversity and large farms with little diversity, including monocultures such as orange (*Citrus* sp.), Mamey (*Pouteria sapota*), banana (*Musa* sp.), Nanche (*Byrsonima crassifolia*) and tamarind (*Tamarindus indica*), among others.

95.6% of producers have 'creole' plants in their gardens and only 4.4% have grafts, which is in agreement with Villegas-Monter *et al*. (2016); Sandoval *et al*. (2006), mentioning that, in commercial mamey plantations, fruit-associated and backyard agroforestry plantations, producers use locally selected genotypes, which is attributable to the lack of improved varieties. On the other hand, the producers mentioned that a characteristic of the plants from grafting is that the fruits are smaller than that of the creoles, in theory, it should be the opposite, but in Alpoyeca, Guerrero, this is not the case, and they begin the production at approximately 5 years and creoles at 7, which coincides with ICUC (2005).

The difference to produce is due to the time lost when planting a native plant from seed. Based on the information of the producers, there are mamey plantations from one to more than 40 years old (Figure 1), which is mainly due to the fact that there are new plantations, in addition to those that have been producing for years. However, most producers (92%) have plants that are in the production stage, considering that their life expectancy can be between 100 and 200 years (Nava and Ricker, 2004).

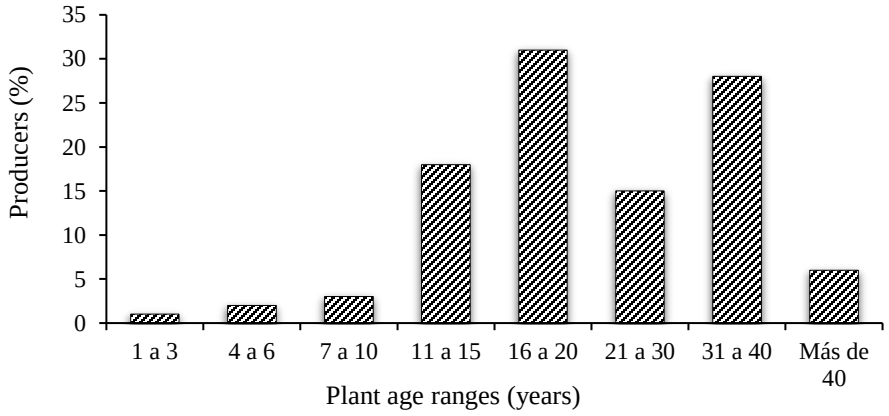

Figure 1. Age intervals of mamey plants in Alpoyeca, Guerrero.

Factors that affect the production of mamey

The producers mentioned technical-biological factors as factors that affect the production of mamey, such as the presence of pests (86%), diseases (58%), poor fertilization of the garden (76%), insufficient water (mainly during the drought) for irrigation (30%), aged trees (25%) and effects attributable to climate change (20%), considered this as the perception of producers in the increase in temperature, changes in the rainy season, decrease in the precipitation that affects flowering, among others.

In the socioeconomic factors, the main problems they detect are the poor organization of producers (60%), lack of economic resources (24%), shortage of labor to carry out activities in the garden (40%) and poor support from federal, state and municipal governments (75%). Controlling pests and diseases of the mamey crop is key, it helps to reduce the negative effects on production (Vásquez-López *et al*., 2009; Committee System Product Mamey Guerrero AC, 2012).

However, the municipal, state and federal governments have neglected support to improve the training and advice of producers in technical-productive aspects, and they have not had the ability to organize themselves to manage supports and control pests and diseases, as well as having approach with universities or research centers that help them identify diseases and in some cases pests.

In Alpoyeca, one of the diseases that affect mamey trees is the *Lasiodiplodia theobromae* fungus that causes descending death by drying the branches (Vásquez-López *et al*., 2009). Floral necrosis (*Penicillium olsonii* and *Alternaria alternata*) is also present, reducing the productivity of commercial orchards; its damage is associated with high relative humidity and wind speed (Vásquez-López *et al*., 2012).

In this regard, Alpoyeca producers observe leaf and fruit damage, but do not identify diseases for their control, affecting the production and longevity of the trees, even causing the death of some. In this situation, it is urgent to manage training to identify diseases that, through effective advice, in the medium and long term, can control the problem.

According to Nava and Ricker (2004), in the Tuxtlas region, the lack of policies or programs in favor of mamey cultivation has negative effects on production, since producers do not carry out proper management of the orchard. In Alpoyeca, there is a lack of support from public and private institutions to support the cultivation of mamey, as stated by 75% of producers, they believe that they have not had it due to the lack of interest in managing support and because government programs have not They contemplate, as it happens with the basic crops like corn, beans and rice. This contributes to the producers neglecting the orchards and not carrying out the management that the cultivation requires, which affects the quality and quantity of fruit obtained.

On the other hand, Alpoyeca, being a municipality with a high degree of marginalization, producers have little opportunity for sources of employment that guarantee them a constant income during the year, making them economically vulnerable to invest in proper management of the garden, as they do not have To buy fertilizers, place entomological traps, as well as the purchase of pesticides, causing the problem in mamey production to become cyclical and more severe.

Yes to this we add that in the eighties the guarantee prices for production were eliminated the subsidies for the commercialization and acquisition of inputs such as certified seeds, fertilizers, agrochemicals, financing, insurance, water, among others (Cedeño and Ponce, 2009; Zarazua-Escobar, 2011), the situation becomes more difficult. For these reasons, mamey producers in Alpoyeca complain of no institutional support to carry out a good management of the orchard that favors the production and quality of the fruit. Given the situation, without a doubt, there has been support, but the lack of interest on the part of the producer and the conflict of interest have limited the organization, which would be a means to face the aforementioned problems and break with the paternalism that exists.

Another situation that affects producers is the incipient organization for the management of productive projects and economic resources, the acquisition of supplies, and training through workshops focused on improving production. This is a key point that must be addressed immediately, by raising awareness (training, workshops, etc.) with producers of the advantages they would have by being organized for the production and marketing of mamey.

Given the aforementioned problems, the producers suggest different options (Figure 2) to improve the production of mamey, it is evident that the paternalism created by the state is present, highlighting that they need institutional support, which could be solved if the farmers were organized . In this regard, Nava and Ricker (2004) in San Andres Tuxtla, Veracruz, highlight the importance of formalizing an organization of mamey producers to increase production, lower costs, find a market and avoid intermediaries.

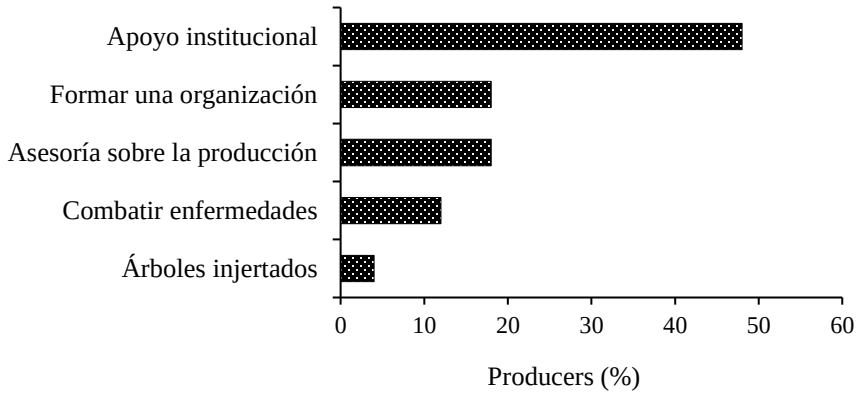

Figure 2. Solutions proposed by producers to improve mamey production in Alpoyeca, Guerrero.

The producers are aware (64%) that the poor organization is a factor that negatively affects the production of mamey, if it can be consolidated, they think that various benefits could be obtained (Figure 3). There are several reasons for initiating promotion and consolidating a producer organization to address at least the immediate problems they suggest. Organization is part of the solution.

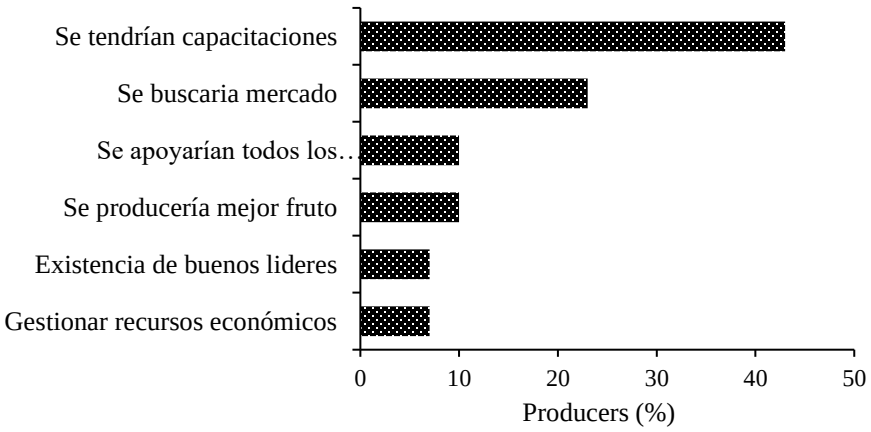

Figure 3. Problems that producers would solve when integrating into an organization in Alpoyeca, Guerrero.

On the other hand, there are producers who do not believe in the organization (36%), because they are aware of a previous mamey that exists in Huamuxtitlan that has not solved the production problem. They mentioned different reasons for not believing in the organization (Figure 4), which suggests that there is no trust between producers or that they are not used to working in groups; in addition to that 78% mentioned that they do not know the objectives pursued by an organization.

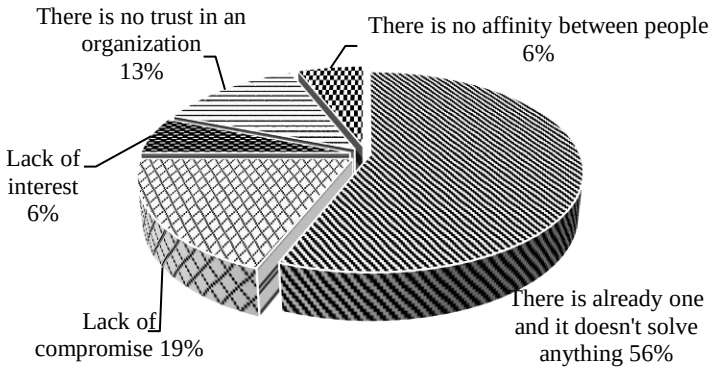

Figure 4. Opinion of the producers who do not believe that being organized would solve the problems to produce mamey in Alpoyeca, Guerrero.

Escobar (2010) refers that through organizations individual and group objectives are achieved, there are also relationships of trust and good social relationships to consolidate as a group (Korsbaeck, 2010). But the producers of Alpoyeca, not knowing the importance of what the organization means, put before them personal expectations that are different from those that the organization can manage for the benefit of its members.

Production and marketing of mamey

56% of the producers mentioned that the production period comprises from December to May, 22% from January to June, 18% from February to April and 4% from November to March (grafted plantations). Ricker *et al*. (1999) indicate that in the Tuxtlas region, the highest production occurs from May to July; while Villegas-Monter *et al*. (2016) mention that there may be production throughout the year. With this it is indicated that the production has to do with the agro-ecological and climatic conditions of each place; as well as the origin where the plants come from (native or grafted).

Mamey trees when coming from seed cause genetic variability, affecting the quality (size and health) of the fruit because the production is not homogeneous, and may have a positive or negative impact on the marketing of the fruit (Vallejo-Pérez *et al*., 2009; Núñez-Colín *et al*., 2017) depending on the supply of the fruit.

In the past (approximately in the year 2000), in an agricultural cycle around 300 kg tree was harvested, currently (2017 year of the investigation), it has been reduced to a third (80 to 100 kg) and the average price is $8.00 per kilo of mamey. In Guatemala, the mamey in shade system with coffee, a tree produces an average of 136 to 250 kg of fruit (ICUC, 2005), which depends on many factors such as density, plant age and management. In the case of Alpoyeca, in addition to pests and diseases that negatively affect yield; lack of pruning, fertilization, winnowing plants, weed control and lack of organization contribute to low-quality production, causing the fruit to be punished by buyers and producers to lose interest in continuing to produce mamey.

Family and contracted labor from the same community is used to harvest the mamey fruit (Figure 5). The height of the trees and the age of the producers (on average 60 years) are the reasons for hiring young labor, they are trees that can reach 20 to 50 m (Nava and Ricker, 2004; ICUC, 2005),

but this is not always available due to migration to the states of Morelos, Guanajuato and Sinaloa in search of work; so there is a need to carry out better technification in the management and harvesting of the mamey in the medium and long term.

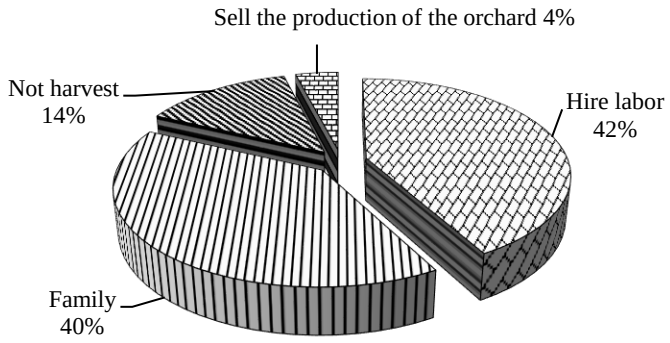

Figure 5. Labor for harvesting the mamey fruit in Alpoyeca, Guerrero.

84% of producers select the fruit (Table 1), according to destination. The smaller fruits go to the local market and the large and attractive ones to regional markets or to the Central de Abastos in Mexico City; however, very large fruits are not always better marketed, the consumer already has the defined size (Committee System Product Mamey Guerrero AC, 2012).

Table 1. Quality and destination of the mamey fruit in Alpoyeca, Guerrero.

Selection of the fruit	Sale (%)	Self-consumption (%)	Local average price per kilo ($)
First	91	9	8
Second	80	20	4.8
Third	60	40	1.4

Based on the information of the producers, in a production cycle approximately $46 591.00 average per hectare is obtained, which according to the Committee System Product Mamey Guerrero, AC (2012), is 20% less than the state estimate, at consider for the same year an average of 9.38 t ha^{-1} at a price of $6 245.25 t. The price of the fruit is a function of the harvest season, the color of the pulp and the number of seeds per fruit.

56% of producers sell mamey in the same community (Alpoyeca) to intermediaries at the foot of the garden or in the producer's house, to consumers who buy from the producer's house or he goes out to offer it to the people, as well as consumers on the street market (once a week). 30% takes it to Mexico City, 10% does not sell the production (self-consumption and losses) and 4% delivers it to intermediaries in the community of Tlaquiltepec (near Alpoyeca).

The sale of the mamey fruit is mainly done to intermediaries (Figure 6) individually, if organized, producers would have the opportunity to set a fair price for the product, but reality shows otherwise, there is resistance to organize. This way of marketing mamey fruit coincides with what ICUC (2005) points out, mentioning that in most places where mamey is grown, it is marketed locally and that exporting is an activity that is not carried out.

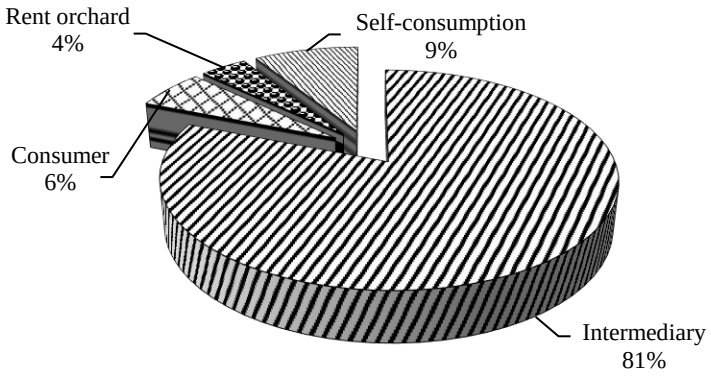

Figure 6. Marketing channels for the mamey fruit in Alpoyeca, Guerrero.

Guatemala adds that the moves Wholesale acopiador 83.5% of the total volume of mamey production and the producer gets the lowest percentage of the final price of the product (15.2 to 27%), contrary to the value obtained by the retailer (59 to 73 although it was not part of this investigation to know the percentage of profit in each of the different actors involved in the marketing chain, from the comments that the producers made on the case, they perceive that they receive the lowest profits. detailed could affirm such an appreciation.

Producers are aware that they must be organized to solve the problem of intermediary, and with this they would improve the family income. 72% mentioned that an objective of the organization would be to first look for a market or marketing channels to improve the price of mamey. Those who do not consider it necessary (28%) are for the following reasons, they are not used to working in a group, they are suspicious of their colleagues, there is no responsibility for work, time is lost in meetings and problems are not solved.

In 2012, the Committee System Product Mamey Guerrero, AC stated that 95% of the families in Alpoyeca attended to the cultivation of mamey, but that the organization of producers was scarce. This suggests that there has been no awareness by any institution that promotes the organization of producers, or that they have remained reluctant to their uses and customs, aspects that should be considered.

Problems and alternatives to market

The producers mentioned six main problems that affect the marketing of the mamey, in order of importance are the sale to the intermediary (81%), market uncertainty (28%), the low price of the fruit (24%), diseases that impair quality (20%), production of small fruits (18%) and fruits affected by pests (6%). If we add these problems to those that affect the production of the mamey fruit, the problem becomes more complex.

The aforementioned problems are characteristics of a subsistence agriculture, as Ecos (1997) refers, this type of agriculture practices polyculture, uses traditional technology, markets in local markets, sells the product to intermediaries, little credit and technical assistance, use family labor and lack of capital. In effect, the production of mamey in Alpoyeca is carried out in a traditional way, with the predominance of polyculture with a high density of plants per hectare, with a topological

arrangement that affects the development of plants, but which producers have maintained as a complex system of plants to get food and income during the year from the sale of products, it also favors self-consumption.

Given the indicated situation, the producers proposed eight possible alternatives to help the problems in the commercialization of the mamey. They stand out being able to receive help from the municipal, state and federal governments, search for national and international markets and form an organization of mamey producers (Figure 7). This indicates that on the part of the producers there is still roots due to paternalism, thinking that it is the government that should support them, limiting self-management initiatives; according to Álvarez and Olvera (2015), they indicate that it is no longer enough to provide support to producers, nor to receive support to receive, now the population must be involved in solving their problems to gradually reduce state welfare.

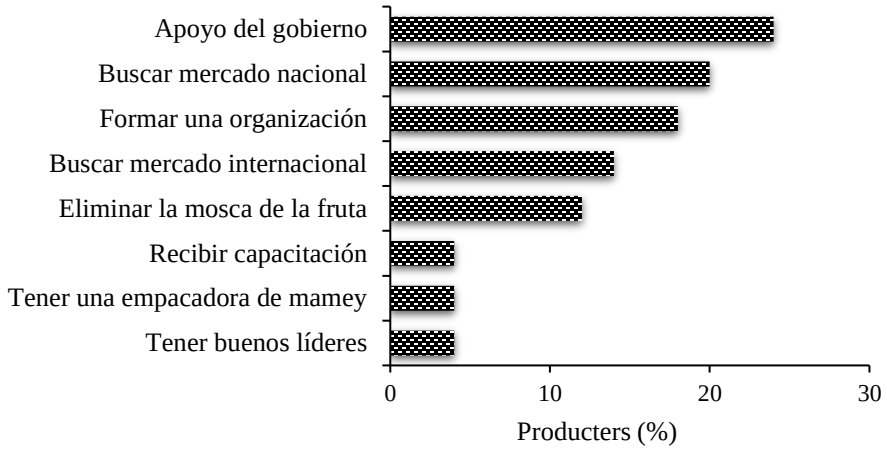

Figure 7. Proposals by the mamey producers that would help solve the commercialization in Alpoyeca, Guerrero.

Conclusions

In the study community, the cultivation of mamey is found mainly as polyculture associated or interspersed with fruit trees and basic crops, with plantations with 'creole' cultivars predominating, causing a diversity of plants that are harvested at different times of the year. In Alpoyeca, the production of mamey is affected by the poor management that the producers carry out in the orchard due to the lack of technical knowledge to carry it out, the low economic solvency for the purchase of inputs and the little or no institutional support for production of the mamey.

The producers interviewed sell the mamey fruit to intermediaries, who set the price since there is no safe market and because there is no institutional support for it, in addition to the fact that the producers, as they are not organized, market individually, so it is important promote and formalize an organization to market jointly.

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